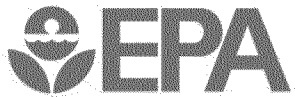




Site Remediation and Technical Support

July 13, 2017

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NPD for Sustainable & Healthy Communities
Research Program**



Remediation of Contaminated Sites

Programs under which EPA (Office of Land & Emergency Management) and its partners (e.g., ORD) conduct cleanup-related activities:

Emergency Response - when the danger from pollutants poses an immediate threat to human health or the environment

Superfund Cleanup - for large, abandoned hazardous waste sites

Federal Facilities Cleanup - for cleanups at facilities owned by the federal government (includes Superfund and RCRA sites)

Brownfields Cleanup - for assessments and cleanups grants related to potentially usable properties

Underground Storage Tank Cleanup - a state-delegated program for cleanups involving underground storage tanks

RCRA Corrective Action - a state-delegated program for hazardous waste management facilities with a spill or release

Cleaning Up Oil Spills - for spills of oil on land and inland waters



Scope of the Site Remediation Problem

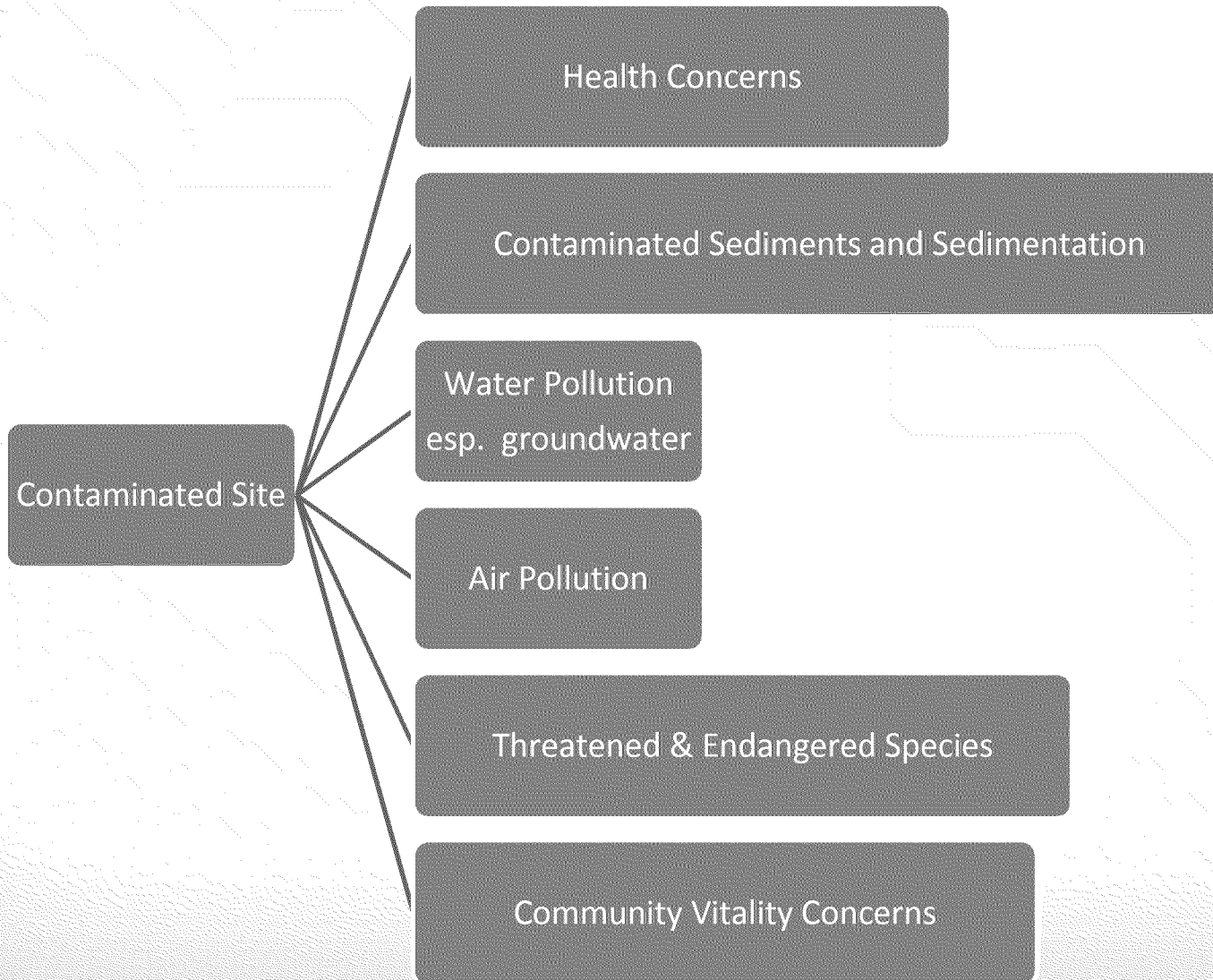
Estimated # of Contaminated Sites

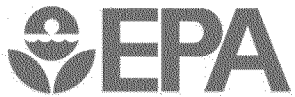
Site Type	Est #
Superfund – Final NPL	1,336
Superfund - Proposed	53
Screening & Assessment for NPL (Site Assessment Sites)	9,702
Removal Sites Only	5,328
UST Release	70,000
RCRA Corrective Action	3,779
Brownfields	450,000
DoD	6,400
DoE	5,000
Other Civilian Agencies	3,000
Abandoned Mines	500,000

- ✓ Continue to invest over \$8 billion a year in remediation
- ✓ 126,000 sites still have contaminated groundwater; closure expected to cost \$110 billion to \$127 billion
- ✓ Fed Gov is financially liable for cleaning up areas where federal activities have contaminated the environment
- ✓ In FY 2016 the fed gov estimated liability was \$447 billion
- ✓ DOE responsible for 83% of this liability



Scope of the Site Remediation Problem



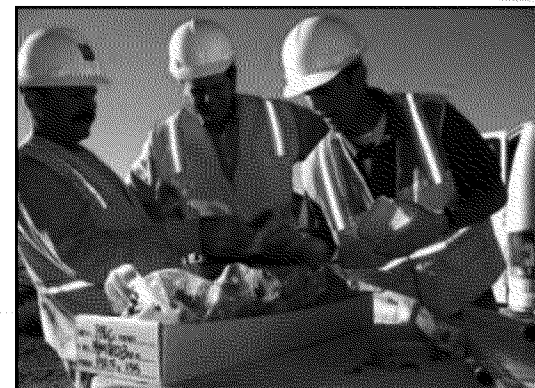


Superfund: Administration Priority

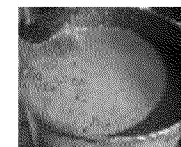
Task force to achieve faster clean-ups

- Identify best practices within regional Superfund programs
- Reduce amount of time between identification of contamination and determination that a site is ready for reuse
- Encourage private investment at sites during and after cleanup
- Realign incentives of all involved parties to foster faster cleanups
- An ORD Superfund Technical Liaison on the task force

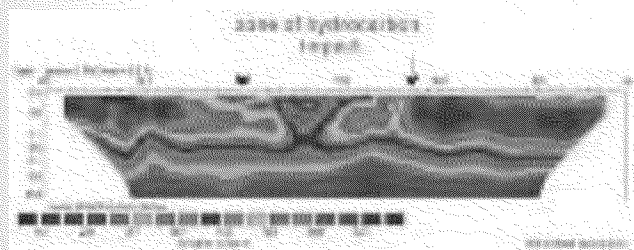
- Technical Support Centers established in 1987
- Quick-response technical support to Program & Regional Offices; Tribal & State environ authorities
- Five (5) Technical Support Centers:
 - Engineering TSC (NRMRL – Cincinnati)
 - Ground Water TSC (NRMRL – Ada, OK)
 - Site Characterization and Monitoring TSC (OSP/Region 4 STL)
 - Superfund Human Health Risk Assessment TSC (NCEA – Cincinnati)
 - IRIS & PPRTV Values
 - Ecological Risk Assessment TSC (NCEA – Cincinnati)
- Superfund Technical Liaisons (ORD Staff) in each Region
 - Tech support to the SF, RCRA & Brownfields programs
 - Facilitate tech & info transfer



- Contaminated groundwater (at 80% of sites) directly impacts and limits both private and community water supplies
- ORD research related to characterization and restoration of contaminated groundwater resources
 - Lab & field work
 - Model & tool development
 - Flux-based site management
 - Back diffusion
 - In-situ Oxidation



Preparation of eZVI on site



Use of geophysics to inform decision making



Use of source-strength functions for site management purposes supplemented with flux-based measurements



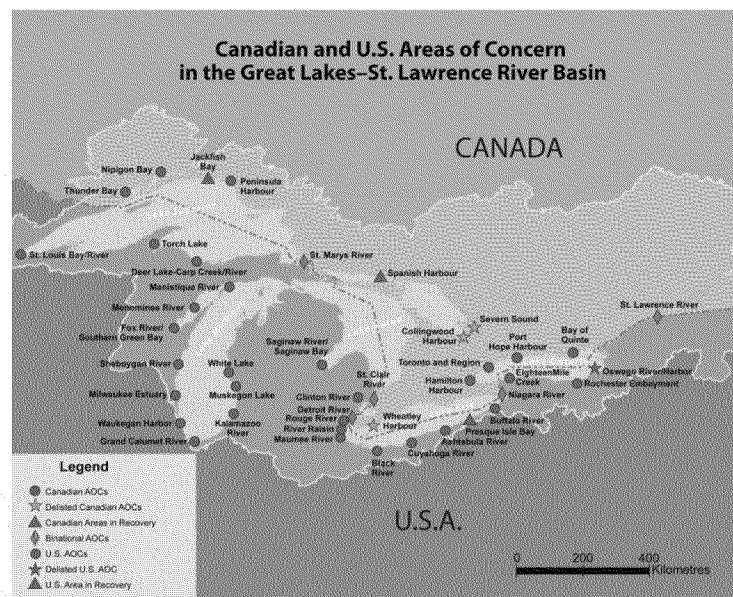
Simultaneous oxidant injection

- [illegible]

EPA coordinates the remediation and restoration of *Areas of Concern* (AOCs; highly impaired post-industrial areas) under the *Great Lakes Water Quality Agreement*

ORD's Research:

- Tools for assessing ecosystem impairments and developing associated remediation targets
- Geospatial models of ecosystem services (e.g., fishing, boating, drinking water) and measures of associated benefits
- Health Impact Assessment of remediation alternatives
- Decision-support information to compare ecosystem services and benefits from various remediation project alternatives



St. Louis River AOC Partners: City of Duluth, MN; MN DNR; MN PCA; WI DNR; Fond du Lac Band of Lake Superior Chippewa; EPA Great Lakes National Program Office; EPA Region 5

Remediate, Restore and Revitalize (R2R2R)

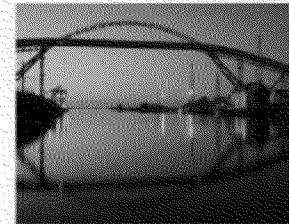
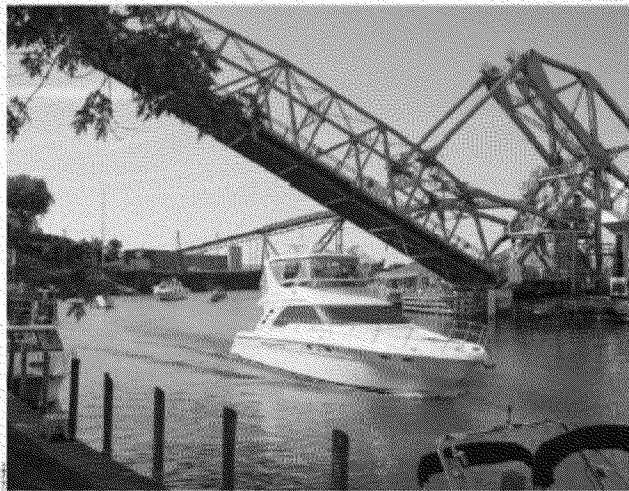
Restoration & Revitalization



Managing Contamination

Partnering companies purchased a 19-acre parcel in Ashtabula Township for a Sediment Consolidation Facility, where contaminated sediments from the riverbed would be stored. This facility was completed in 2006.

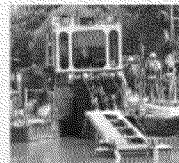
State and federal agencies implemented dredging of the Ashtabula River between 2006 and 2011, removing over 700,000 cubic yards of contaminated sediment from the river and reopening it for commercial shipping and recreational boating. The contaminated material was pumped into a specifically designed landfill and isolated from the environment.



Restoring the River

Restoration of the Ashtabula River began in 2008. About 2,500 feet of fish shelves and a total of 10.5 acres of river, wetland, and upland habitat were created, providing a home for mammals, birds, and fish.

Through the efforts of many, the Hash-abuh-lah River is returning to its former glory as a "river of many fish."



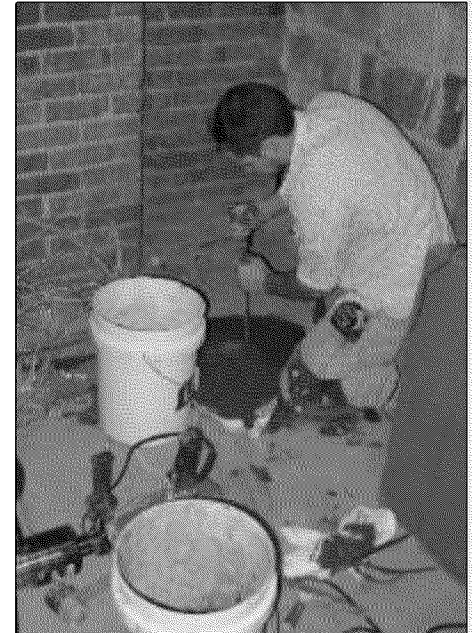
Using funds from the US EPA, US ACE, industry and the State of Ohio, approximately 700,000 cubic yards of contaminated sediment were removed from the river between 2006 and 2010, pumped upland through a 2.5-mile pipeline to a upland sediment consolidation facility and subsequently reloaded, bags that separate contaminated sediment from the slurry water.

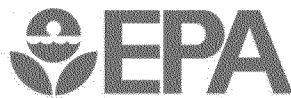
Poster produced by
Ohio EPA and the
Ashtabula River
Partnership
promoting the
connection
between
restoration and
revitalization.

The Ashtabula River Partnership: A model approach to environmental cleanup



- Occurs when there is a migration of vapor-forming chemicals from any subsurface source into an overlying building
- VI into residences and other occupied buildings is a potential problem as soil and groundwater contaminants may volatilize and be transported to the soil surface
- ORD's VI research includes:
 - Understanding vapor pathways (distribution and movement of vapors)
 - Vapor sample collection techniques, materials, probe/well installation
 - Timing of sampling events
 - Use of soil vapor extraction systems to prevent/reduce vapor intrusion
 - Mitigation system effectiveness





Inland Oil Spill Research

EPA is responsible for assessing environmental releases of oil from multiple sources, including fuel from leaking underground storage tanks. These releases occur in communities throughout the country, potentially affecting human health and the environment

Behavior, Fate and
Effects of Oil and Spill
Agents

Protocol Development
for the NCP Product
Schedule

Research to Support
LUST Program
Planning and 90k
Backlog Reduction

ORD develops guidance, supports rulemaking and provides technical assistance for:

- Office of Land and Emergency Management (OLEM)
- Office of Underground Storage Tanks (OUST)
- Office of Water (OW)
- Regions, States, Tribes, other regulatory authorities
- Department of Justice

Age specific soil/dust ingestion estimates
Bioavailability of soil contaminants

LEAF (Leaching Environ Assessment Framework)
Sustainable Materials Management

- Reduce loadings to haz waste sites
- Life cycle assessment methods

Beneficial Use of Materials

- Land application of biosolids
- Use of biochars for remediating metals
- Separation of solvent-water mixtures



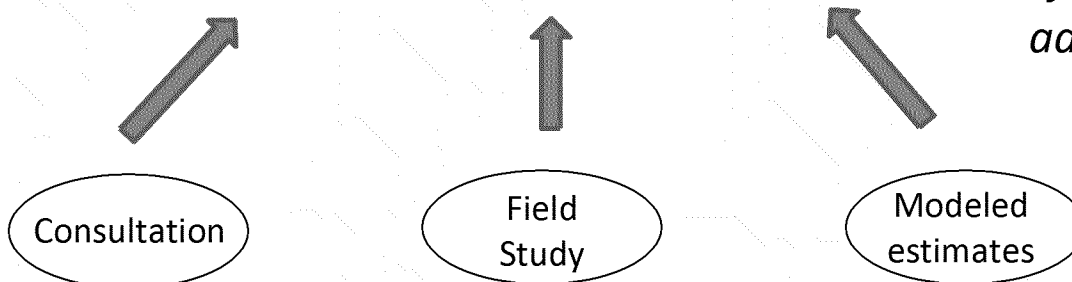
Soil Ingestion Rates Drives Most Superfund Clean Ups

Data gaps in age-specific ingestion rates mean that conservative defaults drive assessments of soil remediation levels and screening level triggers

Superfund is the most soil-centric of programs

Data Need:
Age-specific soil and dust ingestion estimates

Program & regional partners asked ORD to provide soil and dust ingestion rates for all child-specific life stages and adults





Examples of ORD Reports & Articles

Methods and Metrics for Evaluating Environmental Dredging at the Ashtabula River Area of Concern (AOC)

Dispersant Effectiveness, In-Situ Droplet Size Distribution and Numerical Modeling to Assess Subsurface Dispersant Injection as a Deepwater Blowout Oil Spill Response Option and Evaluation of Oil Fluorescence Characteristics to Improve Forensic Response Tools

State of the science review: Potential for beneficial use of waste by-products for in situ remediation of metal-contaminated soil and sediment

Laboratory, Field, and Analytical Procedures for Using Passive Sampling in the Evaluation of Contaminated Sediments: User's Manual

Pilot-Scale Demonstration of In-Situ Chemical Oxidation Involving Chlorinated Volatile Organic Compounds - Design and Deployment Guidelines (Parris Island, SC, U.S. Marine Corp Recruit Depot, Site 45 Pilot Study)

Temporary VS. Permanent Sub-Slab Ports: A Comparative Performance Study



Key Laws and Regulations

Site remediation authorities are spread across multiple statutes, and are held by different levels of government (federal, state, tribal)

- CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act)

 - Superfund

 - 2002 Brownfield Amendments

- Resource Conservation and Recovery Act (RCRA) Corrective Action Program
Underground Storage Tank (UST) (U.S. Code, Title 42, Chapter 82, Subchapter IX)

- Spill Prevention, Control, and Countermeasure (SPCC) Regulation (Section 311(j)(1)(C) of the Clean Water Act as amended by the Oil Pollution Act of 1990)

- National Oil and Hazardous Substances Pollution Contingency Plan (NCP)

 - NCP Product Schedule (products available for use on oil spills)



Superfund Research Authorization

- **Superfund Amendments and Reauthorization Act of 1986, Title I, Section III, and Title II, Section 209, Public Law 99- 499, as amended**
- **SEC. 209. [42 U.S.C. 9660 note] RESEARCH, DEVELOPMENT, AND DEMONSTRATION. (a) PURPOSE.—The purposes of this section are as follows: (1) To establish a comprehensive and coordinated Federal program of research, development, demonstration, and training for the purpose of promoting the development of alternative and innovative treatment technologies that can be used in response actions under the CERCLA program, to provide incentives for the development and use of such technologies, and to improve the scientific capability to assess, detect and evaluate the effects on and risks to human health from hazardous substances. (2) To establish a basic university research and education program within the Department of Health and Human Services and a research, demonstration, and training program within the Environmental Protection Agency. (3) To reserve certain funds from the Hazardous Substance Trust Fund to support a basic research program within the Department of Health and Human Services, and an applied and developmental research program within the Environmental Protection Agency. (4) To enhance the Environmental Protection Agency's internal research capabilities related to CERCLA activities, including site assessment and technology evaluation. (5) To provide incentives for the development of alternative and innovative treatment technologies in a manner that supplements or coordinates with, but does not compete with or duplicate, private sector development of such technologies. (b) AMENDMENT OF CERCLA.—[Added section 311 of CERCLA.] * ***